

SOME TRILOBITES FROM THE SILURIAN/DEVONIAN BOUNDARY BEDS OF CZECHOSLOVAKIA

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ABSTRACT. Some new or stratigraphically especially important trilobites from the Uppermost Silurian (Přídolian) and the Lowest Devonian (Lochkovian) of Bohemia are described. *Tropidocare* gen. nov. and *Prantlia* (*Tetinia*) subgen. nov. are newly erected, and new species described are: *Tropidocare index* sp. nov., *Wolayella ranuncula* sp. nov., *Scharyia nympha* sp. nov. and *Ceratocephala lochkoviana* sp. nov. The description of some species significant for the definition of the Silurian/Devonian boundary, i.e. *Prantlia* (*Tetinia*) *minuta* Přibyl et Vaněk 1962 and *Warburgella* (*Podolites*) *rugulosa rugosa* (Bouček 1934), are completed. In the latter species, particular attention is directed to the individual variability of the sculpture and the changes during ontogeny. The diagnosis of *Warburgella* (*Podolites*) Balashova 1968 is discussed, and the species *Prionopeltis striatus troilus* Hawle et Corda 1847, characteristic of the Uppermost Silurian of Bohemia, has been restituted.

ON the occasion of recent investigations of the Silurian/Devonian boundary beds in the classical area of the Barrandian in central Bohemia, a new rich trilobite material was found; it not only contributes to a more accurate knowledge of the species already well known, but has also yielded some new ones. The present paper contains the descriptions of these several trilobites, especially those which are stratigraphically or otherwise noteworthy.

The pertinent localities are described in detail and the general evaluation of the biostratigraphical significance of the fauna from boundary beds is given in another paper presented at the same time (Chlupáč *et al.* 1970), to which the reader is referred. The terminology in the descriptions of the fauna has been used according to the *Treatise on Invertebrate Paleontology*, Part O, *Arthropoda I* (1959); some further commonly accepted abbreviations have also been employed: L = lateral glabellar lobes, PF = pleural furrows, IPF = interpleural furrows, the greek symbols α - ω = bends of facial suture (in the same sense as, for instance, in G. K. B. Alberti 1969), abax. = abaxially, adax. = adaxially.

The material studied is deposited in the collections of the Geological Survey of Czechoslovakia, Prague (the specimens are designated by the symbol ICh before the inventory number). A further comparative material is to be found in the collections of the National Museum, Prague (abbreviated NM).

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SYSTEMATIC PALAEOLOGY

Family PROETIDAE SALTER 1864
Subfamily PROETIDELLINAE Hupé 1953
Genus TROPIDOCARE gen. nov.

Type species. Tropidocare index sp. nov.

Derivation of name. From the related genus *Tropidocoryphe*.

Diagnosis. Cephalon resembling that of *Tropidocoryphe*, with subtrapezoidal glabella, 3 pairs of glabellar furrows of which deeply incised S_1 completely separates the basal lobes. Preglabellar field long with narrow tropidium, anterior border narrow, without wall-like vaulting. Palpebral lobes strongly abax. curved, of medium size. Occipital ring not tapering laterally with indistinctly separated occipital lobes. Pygidium of Proetidellinae-like character with a narrow axis, richly segmented, and with prominent ribs on the lobes. PF and IPF sharp, both bands of the ribs well and equally developed. Border very narrow.

Remarks. The characteristic feature of the genus is the *Tropidocoryphe*-like cephalon and the Proetidellinae-like pygidium having equally developed the anterior and posterior bands of the ribs. The configuration of the carapace of *Tropidocare* furnishes evidence that the subfamilies Tropidocoryphinae and Proetidellinae are closely related and that connecting links may exist between them. As the first representatives of the subfamily Tropidocoryphinae appear later than those of Proetidellinae, it is possible to conclude that Tropidocoryphinae separated from Proetidellinae, and that just the genus *Tropidocare* could represent one of the connecting links between them. On the other hand, it cannot, however, be excluded that the subfamily Proetidellinae, as conceived in the *Treatise on Invertebrate Paleontology*, is an artificial taxonomical unit to which various proetid trilobites, not related to each other, are assigned. At any rate, *Tropidocare* belongs to phylogenetically noteworthy trilobites.

Prantlia Přibyl 1946 shows a certain analogy, but it differs in the configuration of the frontal part of cranium, lacks a tropidium and has a (sag.) longer pygidium inflated in another way, with a broader border.

Occurrence. See the type species.

Tropidocare index sp. nov.

Plate 19, figs. 1–11, text-fig. 1

Holotype. Cranium (ICh 3067) figured on Plate 19, fig. 2.

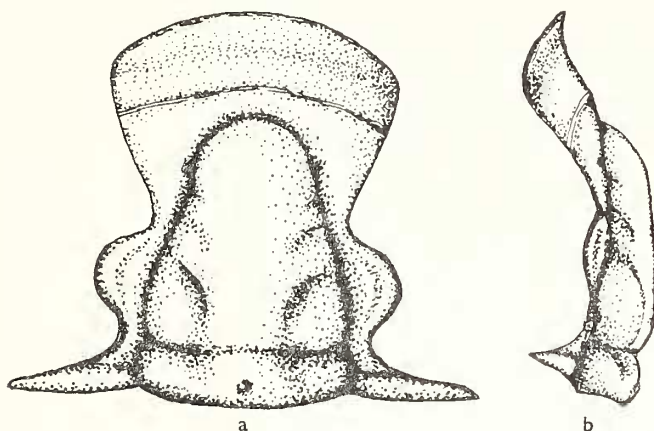
Type locality. Klouk near Suchomasty.

Horizon. Lower part of the Lochkov Formation, *Monograptus uniformis* Zone. Early Lower Devonian (Lower Lochkovian).

Material. Eighteen crania, 21 free cheeks, 35 pygidia preserved as external moulds and their counterparts.

Description. Cranium analogous to that of *Tropidocoryphe*. Glabella subtrapezoidal, of moderate convexity, in the anterior half strongly tapering, anteriorly rounded, bounded by sharp and deep dorsal furrows. Three pairs of glabellar furrows: the posterior (S_1) deep, simply bent, less incised at the occipital furrow, but completely separating the basal lobe which shows a prominent convexity of its own. The median furrows (S_2)

shorter than S_1 but well discernible as a line directed obliquely backwards. The anterior furrows (S_3) short, developed as a short notch in the anterior third of the glabella (easily seen especially on internal moulds). Preglabellar field long sag. (approx. $\frac{1}{3}$ of the length of glabella) with a well-developed narrow tropidium. Frontal part of cranidium anteriorly markedly concave, anterior border not-differentiated, without wall-like vaulting, only moderately upraised. Occipital furrow sharp, laterally (posterior to L_1) widened and connected with the dorsal furrow. Occipital ring not tapering laterally with indistinctly separated occipital lobes; median tubercle small.



TEXT-FIG. 1a-b. *Tropidocare index* sp. nov., cranidium: a, dorsal view; b, lateral view from the left, $\times 10$.

Fixed cheeks in the anterior part moderately convex, sloping antero-laterally. Palpebral lobe of medium size, strongly curved abax., inflated, with a shallow palpebral furrow. The posterior part of the fixed cheeks triangular, strongly widened abax., posterior border narrow. Facial sutures: anterior branch (β - γ) long, diverging at an angle of 20 - 25° to the sag. axis, β rounded, γ at a short, almost equal distance from dorsal furrows as ϵ ; ω , in a longitudinal projection lies considerably further from the sag. axis than β .

Free cheeks show a moderately convex genal field with a narrow tropidium which dies out postero-laterally. The border furrow is represented by a broad depression, lateral border gently upraised. Genal spine of medium length, rapidly tapering distally, with a marked longitudinal furrow which extending from the genal angle continues on to the spine. The posterior border broadening abax., separated by a sharp posterior border furrow. Doublure concave with parallel lines.

Pygidium semicircular, richly segmented. Axis narrow, strongly arched tr., very slowly tapering backwards, composed of ten complete rings (+articulating half-ring and terminal piece). In the antero-lateral part of each ring a pit-like appendifer. Post-axial ridge narrow but distinct, continuing onto the border. Dorsal furrows deep. Pygidial lobes inflated, near the border region abruptly sloping to the border. On the lobes, 5-6 sharply separated complete ribs broadening abax. The ribs are separated by sharp narrow PF which in their whole course maintain the same breadth and depth.

IPF also sharp during their whole course, however, less incised than PF, dividing the ribs into almost equally broad bands (the posterior bands near the border region broadened). Border furrow weak, border very narrow, flat. Pygidial doublure narrow, concave, with parallel lines.

Sculpture. Not whitened, the surface of the carapace seems to be smooth, and only after whitening it shows very fine granulation on the glabella, occipital ring, and pygidial axis; marks of ridges indicate genal caeca; in addition, on the genal field, punctation is also discernible (for instance, ICh 3165).

Measurements (in mm)

| <i>Cranidium</i> | <i>Length of cranidium</i> | <i>Length of glabella</i> | <i>Breadth of glabella</i> |
|------------------|--------------------------------|-------------------------------|--------------------------------|
| ICh 3067 | 4.5 | 3.0 | 2.2 |
| ICh 3068 | 3.2 | 2.0 | 1.7 |
| ICh 3069 | 4.0 | 2.7 | 2.0 |
| ICh 3070 | 4.1 | 2.6 | 2.1 |
| | <i>Pygidium</i> | <i>Length</i> | <i>Breadth</i> |
| | ICh 3072 | 4.0 | (6.8) |
| | ICh 3073 | 3.0 | 6.5 |
| | ICh 3074 | 3.9 | 7.0 |
| | ICh 3075 | 4.0 | (7.0) |

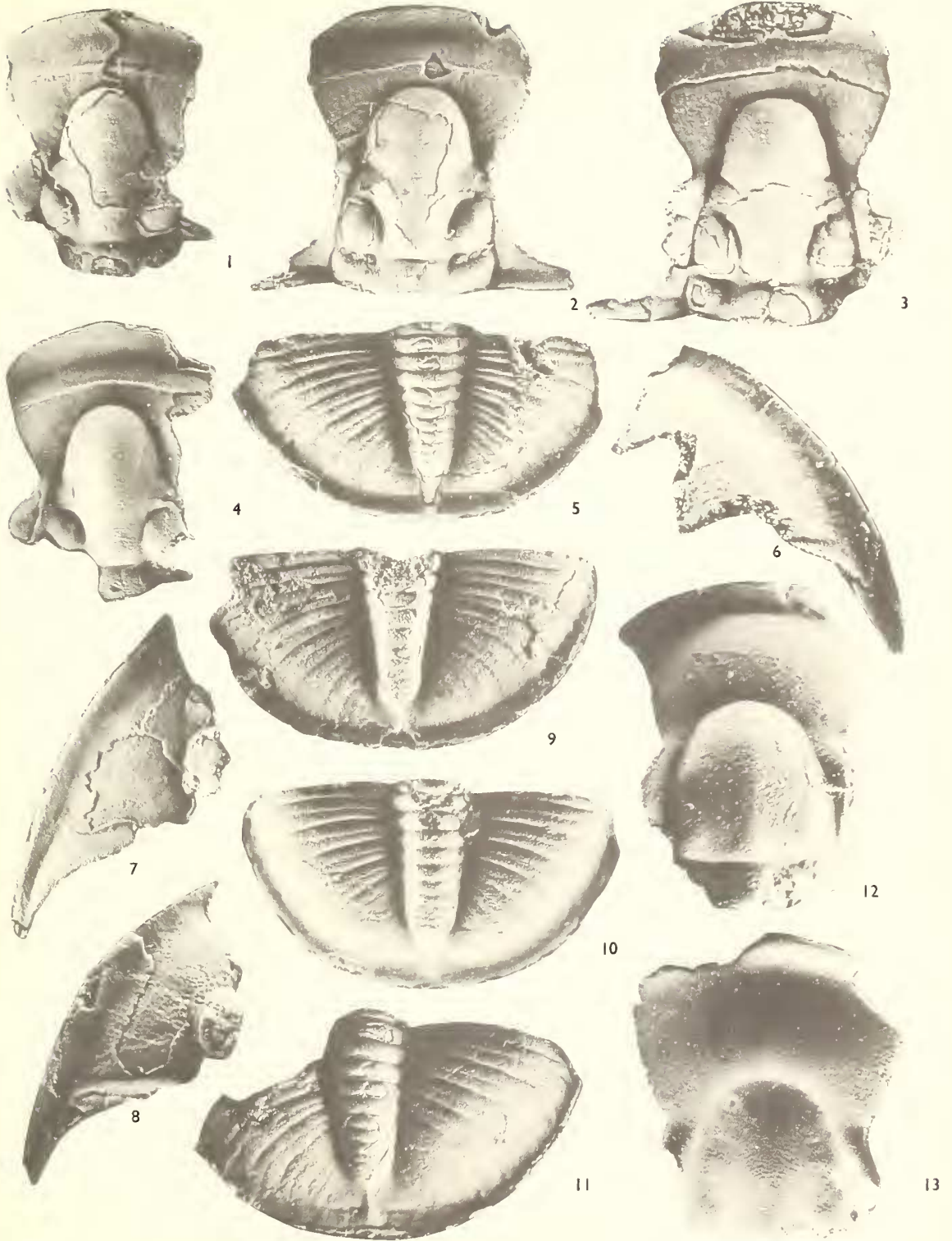
Remarks. As mentioned in the discussion of the genus, the characteristic feature is the analogy with *Tropidocoryphe* as to the configuration of cranidium, and typically proetidellid-like pygidium. The cranidia examined belong, no doubt, to the pygidia, as at the type locality, Klonek, in a 20–25-cm thick bed (No. 95: Chlupáč *et al.* 1970) a confusion with another trilobite is excluded, any other analogous trilobites being absent there; in addition, the cranidia and pygidia also correspond to each other as to their frequency and size, and with regard to the fact that occasionally both were found lying close to each other on the same bedding plane.

In the bed 95 at Klonek, in addition to the specimens of normal size, remains of young individuals have also been encountered. The smallest pygidium found measured 1.5 mm in length and 3.00 mm in max. width (ICh 3078). Compared with the remains of adult specimens, this pygidium is flatter with deeper incised PF and wider border. Another pygidium (ICh 3077) 2.0 mm long and 3.8–4.0 mm broad already very closely resembles the adult specimens from which it differs in a somewhat wider border only.

There is only one trilobite from the Lochkovian, so far described, which displays a certain similarity, i.e. *Tropidocoryphe? heteroclyta* (Barrande 1872) which is known

EXPLANATION OF PLATE 19

Figs. 1–11. *Tropidocare index* sp. nov. Lower Lochkovian, Klonek (figs. 1–9, 11), Karlštejn (fig. 10). 1, Cranidium (ICh 3069), $\times 11.5$. 2, Cranidium, holotype (ICh 3067), $\times 10$. 3, Cranidium (ICh 3068), $\times 13$. 4, Cranidium (ICh 3070), $\times 11$. 5, Pygidium (ICh 3072), $\times 8$. 6, Right free cheek (ICh 3076), $\times 8$. 7, Left free cheek (ICh 3071), $\times 10$. 8, Left free cheek (ICh 3079), $\times 9$. 9, Pygidium (ICh 3073), $\times 8$. 10, Pygidium (ICh 3074), $\times 8$. 11, Pygidium (ICh 3075), $\times 8$. Figs. 12–13. *Wolayella rammeula* sp. nov. Upper Lochkovian, Kosoř. 12, Cranidium (ICh 3273), $\times 13$. 13, Negative counterpart of cranidium (ICh 3269), $\times 12$.



from the find of a single pygidium. This pygidium, however, has the anterior and posterior bands of ribs developed in the anterior three ribs only, furthermore, the axis is substantially shorter and the general configuration much more resembles *Tropidocoryphe*.

Occurrence. All the occurrences so far known belong to the Lower Lochkovian, *Monograptus uniformis* Zone.

In addition to the locality Klonk near Suchomasty where *Tropidocare index* sp. nov. occurs fairly abundantly in the bed 95 (black-grey fine-grained limestone) together with *Ceratocephala lochkoviana* sp. nov., further finds come from the locality Karlštejn-Budňanská skála rocks, the Koukolova hora Hill (the quarry below the summit) and Lejškov near Zdice (for detail of localities, see Chlupáč *et al.* 1970).

Genus PRANTLIA Příbyl 1946

Type species. *Proetus longulus* Hawle et Corda 1847.

Subgenus PRANTLIA (TETINIA) subgen. nov.

Type species. *Prantlia minuta* Příbyl et Vaněk 1962.

Derivation of name. From the locality Tetín near Beroun, where the type species commonly occurs.

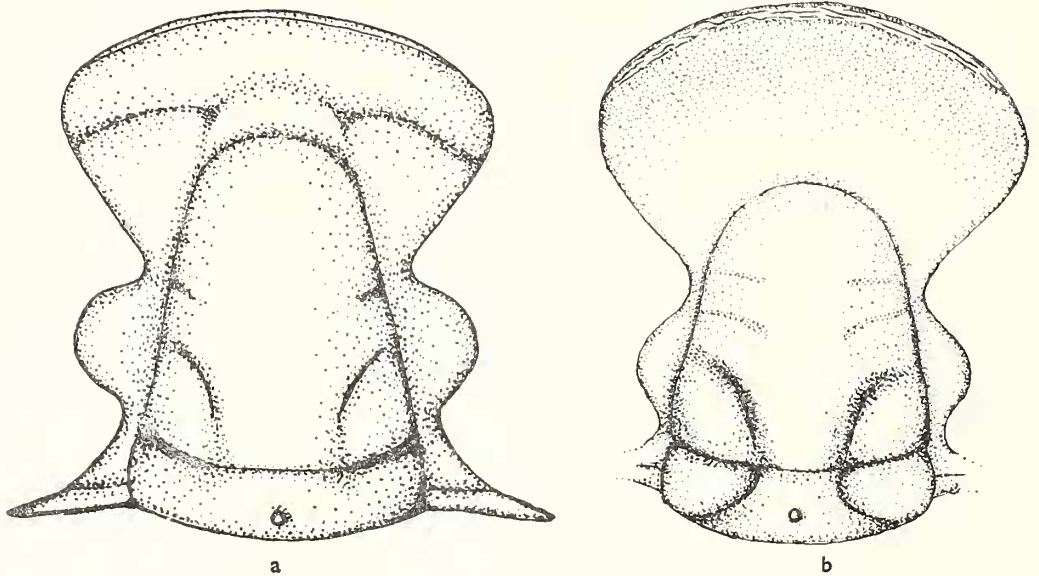
Diagnosis. Glabella longly subtrapezoidal, blunt anteriorly. The posterior glabellar furrow S_1 completely separates the basal lobes, S_2 short and shallow, S_3 scarcely perceptible. In the frontal area, parallel shallow axial furrows continue forward to the border furrow, defining a low preglabellar lobate tract. Border furrow sharp, deeply incised laterally, bent in a connecting line with the dorsal furrows, shallowed and conspicuously arcuate anterior to the frontal lobe. Anterior border flat, broad (sag.). Pygidium similar to that of *Prantlia* but shorter, with conspicuously inflated lobes and a lesser number of axial rings (10) and ribs (4–6).

Remarks. The most characteristic feature of *P. (Tetinia)* is the configuration of frontal area of cranidium. *Prantlia (Prantlia)* Příbyl 1946 differs especially in long (sag.) concave preglabellar field, ill-defined border furrow, narrow upraised border, subconical shape of glabella, three distinct pairs of glabellar furrows (S_2 substantially longer, S_3 well perceptible) and in prominent occipital lobes. It should be noted that the drawing of *Prantlia longula* published by Příbyl (1946, pl. 1, fig. 12) according to a figure taken over from Novák's unpublished manuscript and reprinted in the *Treatise* (1959, fig. 301b) is idealized. A good figure of the same specimen according to which the drawing was made (NM 55/67) was presented by Horný and Bastl (1970); see also Plate 20, figs. 10–11. *Warburgella* Reed 1931 is distinguished especially by the frontal area with distinct tropidium. The punctuation of carapace of *P. (Tetinia)* may be of some importance, but with regard to the single species of *P. (Tetinia)* so far known it could be hardly regarded as a diagnostic feature of subgeneric value.

Occurrence. See the type species.

Prantlia (Tetinia) minuta Příbyl et Vaněk 1962

Plate 20, figs. 1–9, Plate 24, fig. 9; text-fig. 2a

1962 *Prantlia minuta* Příbyl et Vaněk; pp. 26–30, pl. 1, figs. 1–5, text-fig. 1.*Material.* More than 120 selected cranidia, 150 pygidia, a great number of free cheeks, and 5 hypostomes mostly well preserved in limestones.

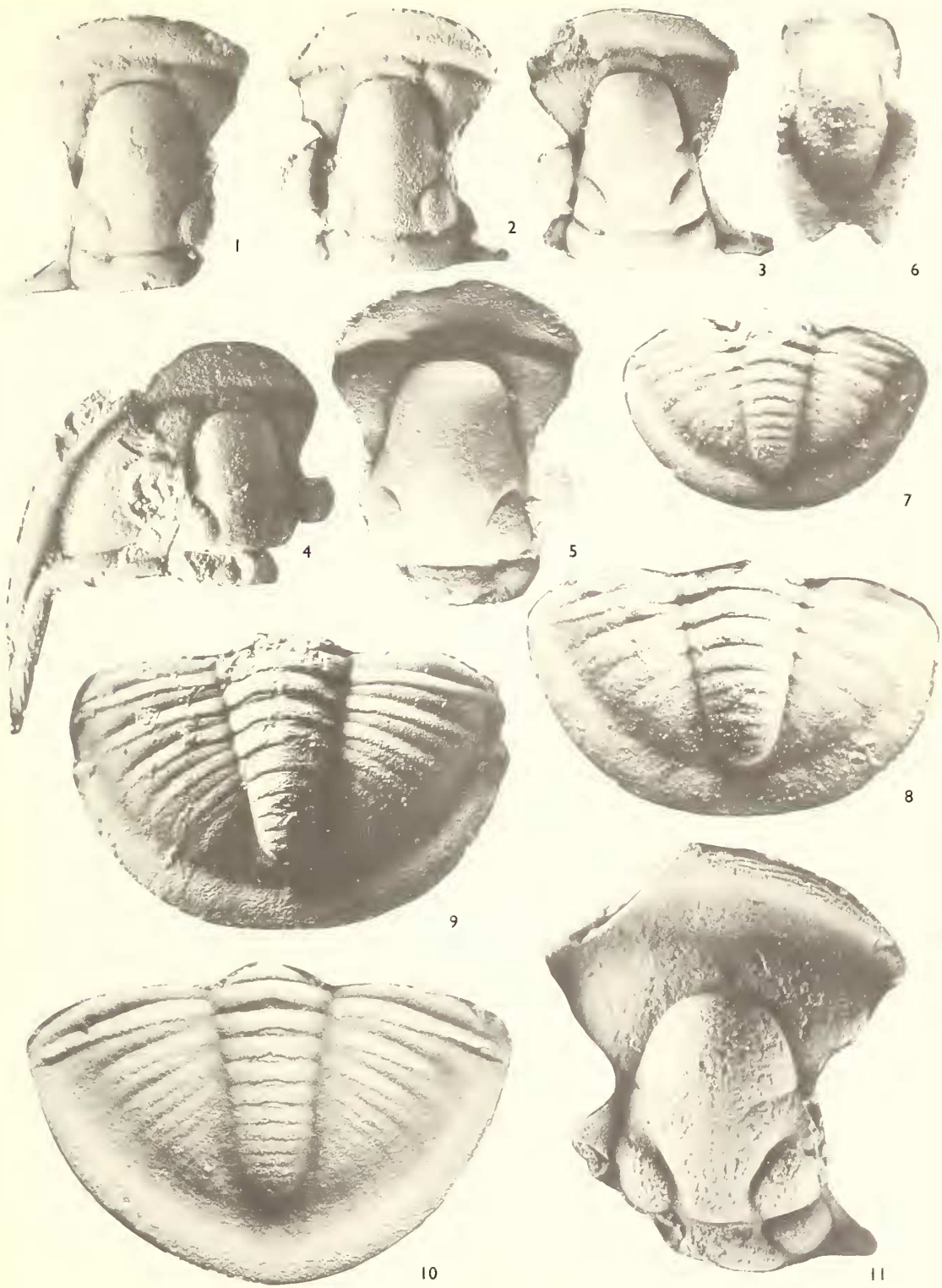
TEXT-FIG. 2. Comparison of cranidia of *Prantlia (Tetinia) minuta* Př. et V. (a), and *Prantlia (Prantlia) longula* (H. et C.) (b). Dorsal view, about $\times 15$.

Remarks. On the basis of a recently found rich material, the description presented by Příbyl and Vaněk (1962) can be completed. On the carapace surface two lateral glabellar furrows (S_1 , S_2) are clearly discernible: S_1 sharp, completely delimiting L_1 , S_2 much shorter. S_3 mentioned by Příbyl and Vaněk in most specimens not perceptible. The occipital lobes ill-defined, their separation marked by broadening of occipital furrow only. If well preserved, cranidium and free cheeks display a distinct sculpture: fine punctation, on basal lobes and on the occipital ring combined with scale-like ridges. A marked rather deep punctation to reticulation can be seen on the anterior part of

EXPLANATION OF PLATE 20

Figs. 1–9. *Prantlia (Tetinia) minuta* Příbyl et Vaněk, 1962; Uppermost Přídolian. 1, Cranidium (ICh 3313); Tetín, $\times 10$. 2, Cranidium (ICh 3315); Tetín, $\times 10$. 3, Cranidium (ICh 3314); Holyně, $\times 10$. 4, Cranidium and left free cheek (ICh 3310); Svatý Jan, $\times 10$. 5, Cranidium of a large specimen (ICh 3312); Srbsko, $\times 9.5$. 6, Hypostome (ICh 3307); Nová Ves, $\times 12$. 7, Pygidium (ICh 3305); Holyně, $\times 9$. 8, Pygidium (ICh 3306); Holyně, $\times 12$. 9, Pygidium of a large specimen (ICh 3303); Tetín, $\times 9$.

Figs. 10–11. *Prantlia (Prantlia) longula* (Hawle et Corda 1847). Kopanina Formation, Řeporyje. 10, Pygidium (ICh 3316), $\times 10$. 11, Cranidium (ÚÚG p. 12258), $\times 12$.



fixed cheeks and the genal field of free cheeks. The anterior border proper pitted finely and regularly.

Pygidial axis composed of 10 complete rings (plus terminal piece). In adult specimens of normal size, 6 ribs are usually developed on the lobes; between the last discernible rib and the axis there is a certain space; PF and IPF on the surface of carapace of adult specimens are shallow, the relief of the lobes being therefore not sharp.

Hypostome: anterior lobe oval, only in the abax. part separated by a weak median furrow from the broader (tr.) posterior lobe. The border region extends anterolaterally into broad short anterior wings; lateral wings rounded, very conspicuous posterior wings prolonged into sharp points. Border region, on the whole, flat.

During recent collecting, remains of young specimens were found. Even the smallest cranidia encountered, measuring 1.5–2.0 mm in length do not substantially differ in any way from the specimens of normal size. The smallest pygidia found, 1.0–1.5 mm in length (sag.) and of a max. breadth 2.0–2.7 mm are in general broader than those of the adult specimens; their pleural lobes are flatter, their PF and IPF are sharper, the border furrow is deeper and the border is somewhat broader and flatter.

Measurements. The smallest cranidium found is 1.5 mm in length (sag.), the largest 4.8 mm. The smallest pygidium is 1.0 mm long, breadth being 2.0 mm; the length of the largest pygidium is 5 mm, its breadth being 7.5 mm.

Occurrence. *P. (T.) minuta* characterizes an important horizon of small thickness (not exceeding 3 m) at the Přídolian/Lochkovian boundary in the Barrandian Area, closely underlying the *Warburgella rugulosa rugosa* Horizon. However, its occurrence is restricted to a purely carbonate facies that is locally very abundant at the pertinent level. Localities: Nová Ves near Praha, Holyně (north-east of Opatřilka), Řeporyje (quarries 'Na požárech), environs of Svätý Jan pod Skalou and further localities as Mořina, Srbsko, Tetín, etc. (Chlupáč *et al.* 1970).

Genus WARBURGELLA Reed 1931

Type species. *Asaphus stokesi* Murchison 1839.

Remarks. Emended diagnosis and discussion of this genus was presented by Ormiston (1967). Within the framework of the above genus Balashova (1968) has recently separated the subgenus *Warburgella (Podolites)* Bal., which, however, in most of the diagnostic features given by Balashova (1968, p. 102) agrees with the nominate subgenus (see redescription of the type species *W. stokesi* by Whittard 1938), i.e. breadth of preglabellar field, configuration of the border, course of tropidium, sharp incision of S_1 , size of palpebral lobes, configuration of occipital ring, narrow pygidial axis, and short postaxial ridge. The value of some further diagnostic features given by Balashova is questionable as they are either individually variable (sculpture) or varying during the ontogenic development, sometimes also influenced by the state of preservation (sharpness of the border line, etc.). Of the characteristics which can be regarded, although with reserve, as really diagnostic for *W. (Podolites)*, there remains only the presence of a transverse ridge posterior to the anterior border furrow (before tropidium) and

a lower number (8) of thoracic segments; the latter feature, however, should be still more thoroughly verified by more finds of complete carapaces of adult specimens.

Occurrence. Lower Silurian (or even Ashgillian) to early Lower Devonian. Europe (Podolia, Barrandian area, the Rheinishes Schiefergebirge, Poland), North Africa (Morocco), North America (Canadian Arctic).

Warburgella (Podolites) rugulosa rugosa (Bouček 1934)

Plate 21, figs. 1-14

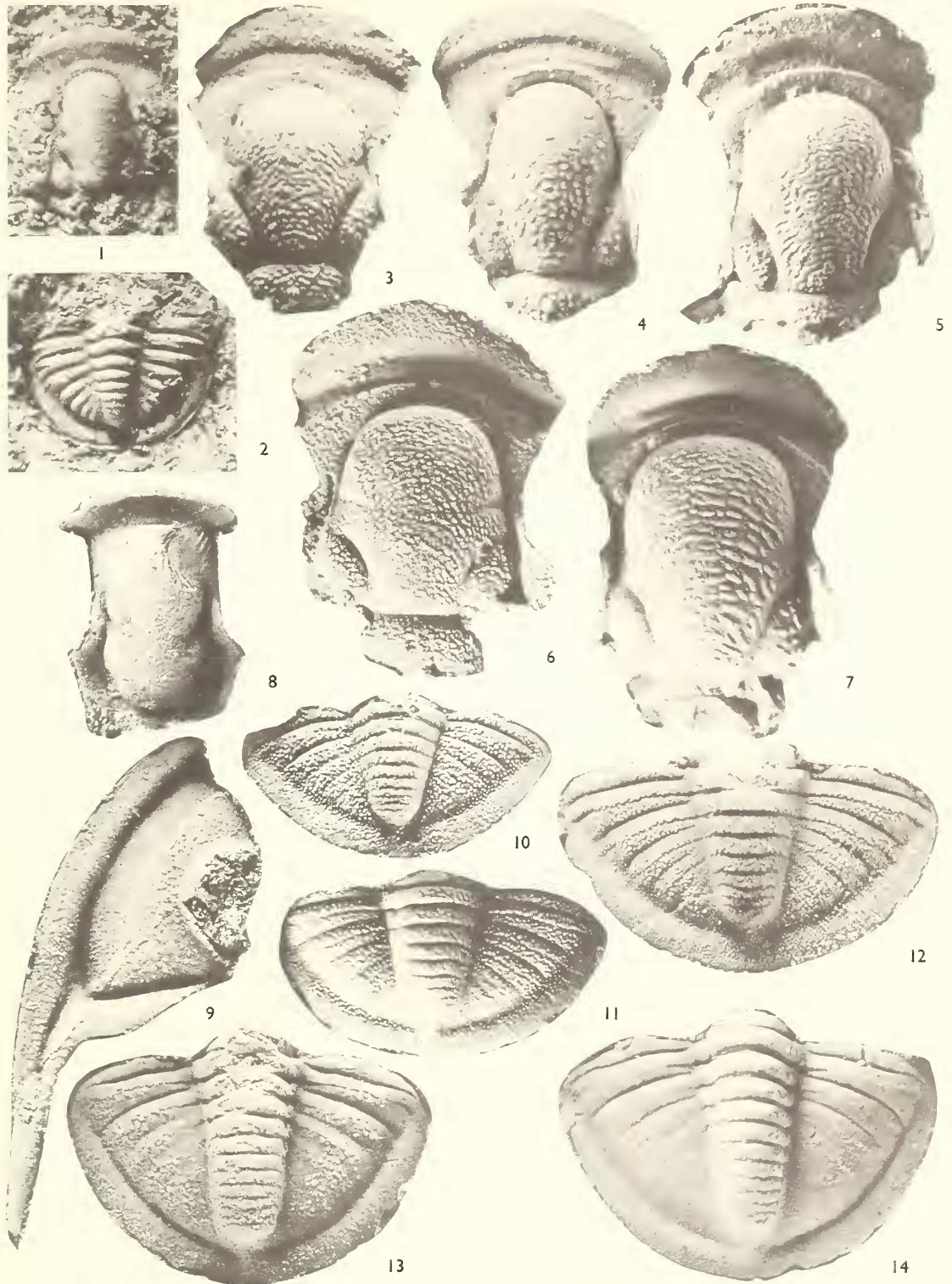
- 1934 *Cyphoproetus rugosus* Bouček; pp. 2-3, pl. 1, figs. 7-10.
 1963 *Warburgella rugulosa* (Alth 1874) *rugosa* (Bouček 1934); G. Alberti, pp. 157-8, pl. 15, figs. 1-6; pl. 16, figs. 1-4; text-fig. 1b (here earlier synonymy).
 1968 *Warburgella (Podolites) rugulosa*: Balashova, pp. 102-3, pl. 2, figs. 15-23.
 1968 *Warburgella (Podolites) rugulosa rugosa*: Balashova, p. 104, pl. 2, figs. 10-14.
 1969 *Warburgella rugulosa maura*: G. Alberti, pp. 353-6, pl. 32, figs. 1-11; pl. 33, figs. 5-13; pl. 43, fig. 17; text-fig. 42, 43b₁₋₃. (here further synonymy).

Material. About 300 selected cranidia and more than 200 pygidia, a great number of isolated free cheeks and several hypostomes (all well preserved as external or internal moulds in limestones).

Remarks. The recently found material permits the study in greater detail of the individual variability as well as the changes during the ontogeny. In the first place, sculpture appears to be the most variable feature. Even in individuals of the same size and from the same stratigraphic horizon, variability of sculpture, especially marked on glabella, can be observed: some specimens display close-set, rather long curved ridges (cf. Pl. 21, fig. 5), or other specimens are frequently found which show rather short and interrupted coarse ridges more widely spaced from each other (Pl. 21, fig. 7 and also specimens figured by Alberti 1963, pl. 15, figs. 1-3); others have still sparser ridges which especially in the anterior part of glabella gradually die out (Pl. 21, fig. 4); some show fine, densely crowded short ridges (Pl. 21, fig. 3) and a sculpture resembling that of the specimens figured by Alberti (1969, pl. 32, figs. 1-11) from Morocco and designated as *W. rugulosa maura* Alberti. Finally, in the new material, specimens were also found, the ridges of which are very weak resembling in sculpture the cranidia of *W. cf. baltica* Alberti figured by Alberti (1963, pl. 15, figs. 10-11) from the Baltic Silurian. As on glabella, also on pygidium, especially on pygidial ribs, the size and density of granules

EXPLANATION OF PLATE 21

Figs. 1-14. *Warburgella (Podolites) rugulosa rugosa* (Bouček 1934); Lower Lochkovian. 1, Cranidium of the youngest specimen found (ICh 3286); Radotín Valley, ×30. 2, Pygidium of a young specimen (ICh 3285); Radotín Valley, ×25. 3, Cranidium (ICh 3287); Karlštejn, ×15. 4, Cranidium (ICh 3295); Svatý Jan, ×14.5. 5, Cranidium (ICh 3294); Holyně, ×14. 6, Cranidium (ICh 3290); Koukolova Hora, ×14. 7, Cranidium of a large specimen (ICh 3281); Karlík, ×12. 8, Hypostome (ICh 3293); Srbsko, ×11. 9, Left free cheek (ICh 3282); Karlík, ×11. 10, Pygidium (ICh 3279), slightly compressed; Karlštejn, ×10. 11, Pygidium (ICh 3280); Lejškov, ×11. 12, Pygidium (ICh 3278); Koukolova Hora, ×11. 13, Pygidium of a large specimen (ICh 3277); Srbsko, ×10.



markedly varies (cf. Pl. 21, figs. 10–13); the cranidia with fairly coarse sculpture belong to pygidia with rather marked granulation, and inversely.

As the whole material was collected in the sections which had been studied in detail, its assignment to the same stratigraphic horizon is indubitably correct and it is evident that the variations of sculpture do not depend on the stratigraphic level of the occurrence. At a certain locality and especially in a definite lithological type of rocks, specimens frequently prevail which show a certain type of sculpture (in the facies of dark platy limestone individuals with a coarser sculpture predominate, while in light organo-detrital limestones specimens with sparser or finer sculpture occur). However, at the same locality and in the same bed, specimens showing various deviations of sculpture can often also be found. From the mode of occurrence it may be concluded that the sculpture was evidently influenced in the first place by purely local microfacies conditions and that this variability is of individual character and depends on ecological conditions. In addition, certain changes in the sculpture can also be established during the post-larval ontogenic development (the younger specimens usually display a more close-set and finer sculpture); these variations, however, are less conspicuous.

Considering the results of the above observations it can be stated that the erection of subspecies within the species *Warburgella rugulosa* (Alth) on the basis of minor variations of sculpture only, does not appear as fully justified. On the other hand, variability of sculpture also has certain limits: for instance, none of the specimens found in the Barrandian Basin agrees in its sculpture with those described as *Warburgella rugulosa rhenana* Alberti from the Rhineland or with *W. rugulosa canadensis* Ormiston from the Canadian Arctic which both evidently represent true subspecies.

The recently found material makes a study of ontogeny possible. The smallest cranidia found (ICh 3284, 3286) 0.7–1.0 mm in length, compared with adult specimens, have substantially narrower and longer glabella with sharp S_1 and S_2 but with a weak tropidium and a transverse ridge posterior to the anterior border furrow (Pl. 21, fig. 1). In cranidia measuring 1.6–1.8 mm in length (e.g. ICh 3288), glabella is still relatively long, but the tropidium and the transverse ridge are already more prominent. During further development (cranidia 2.5–3.0 mm long (sag.) (Pl. 21, figs. 3–6)), glabella broadens, especially in the posterior part, assuming thus the characteristic usual shape, and the development proceeds in the way described by Alberti (1969, pp. 355–6). The specimens of this stage of growth mostly prevail in number. In specimens of larger size (length of cranidium 4–6 mm) the difference between the anterior and posterior parts of glabella diminishes, the glabella becoming rather subquadrate in outline (cf. Pl. 21, fig. 7).

Striking variations can be observed on pygidia during the ontogenic development. The smallest pygidia found 0.5–0.8 mm in length (Pl. 21, fig. 2) show a strikingly sharp relief, deep incised PF, 6–7 prominent ribs on the lobes and a markedly differentiated border; IPF of the anterior ribs, are characteristically abax. bent backwards in crescentic form, continue on to the border (typical larval feature of proetids). Pygidia 1.5–2.0 mm long are distinguished by a major breadth (ratio length to breadth = about 1:2), flatter lobes, less incised PF and IPF and a smaller number of ribs (5–6) on the lobes (Pl. 21, figs. 10–12). Pygidia of this size are most frequent and correspond to cranidia 2–3 mm long. In major pygidia, of lengths exceeding 2.5 mm, a tendency towards prolongation of the pygidium and continuing shallowing and reduction of PF and IPF

in the posterior parts of the pygidial lobes can be observed, so that only 2–3 complete anterior ribs are prominent, IPF being only very weak (see Pl. 21, fig. 13).

From the above notes it follows that in evaluating the diagnostic features within *Warburgella rugulosa* (Alth) it is necessary to proceed with considerable caution and to use specimens derived from various environments and of different stages of ontogenetic development. In this connection the distinguishing of *W. (P.) rugulosa rugulosa* (Alth) and *W. (P.) rugulosa rugosa* (Bouč.) on the basis of diagnostic features given by Balashova (1968) appears as not fully justified and insufficient for an objective differentiation. However, as the problem of the types of the nominate subspecies *W. (P.) rugulosa rugulosa* (Alth) has not yet been definitively solved (the original material being lost?), the present author retains, for the sake of objectiveness, the designation *W. (P.) rugulosa rugosa* (Bouček) for the material from the Barrandian area, pointing out that a possible identity with the nominate subspecies (cf. Alberti 1969) could be proved only after the establishment of the lectotype or neotype of the nominate subspecies.

Occurrence in the Barrandian. *Warburgella (P.) rugulosa rugosa* (Bouč.) forms a significant horizon in the early Lower Devonian (Lower Lochkovian), approximately corresponding to the *Monograptus uniformis* Zone. The above species was found at practically all localities where the Silurian/Devonian boundary was studied in detail: Karlštejn–Budiňanská skála (type locality), Klouk near Suchomasty, Čertovy Schody, Lejškov, Koukolova hora, Tetín, Kosov, Srbsko, various localities in the environs of Svatý Jan pod Skalou, Loděnice–Branžovy, Řeporyje, Holyně, Nová Ves, Praha–Podolí, Černá rokle gorge below Barrandov, localities in the Radotín valley, Vonoklasy, Karlík, and others (Chlupáč *et al.* 1970). It is important that *W. (P.) rugulosa rugosa* (Bouček) is abundant at the same level in the facies of dark platy limestones as well as in organodetrital facies, so that it is one of the most suitable fossils for correlation in the boundary interval.

Subfamily PRIONOPELTINAE Příbyl 1946
Genus PRIONOPELTIS Hawle et Corda 1847

Type species. *Phaeton archiaci* Barrande 1846.

Prionopeltis striatus troilus Hawle et Corda 1847

Plate 22, figs. 1–6; Plate 23, figs. 7–10; text-fig. 3a, b

1847 *Prionopeltis troilus* Hawle et Corda, p. 124.

Lectotype. Cranidium with free cheek (NM 361/67).

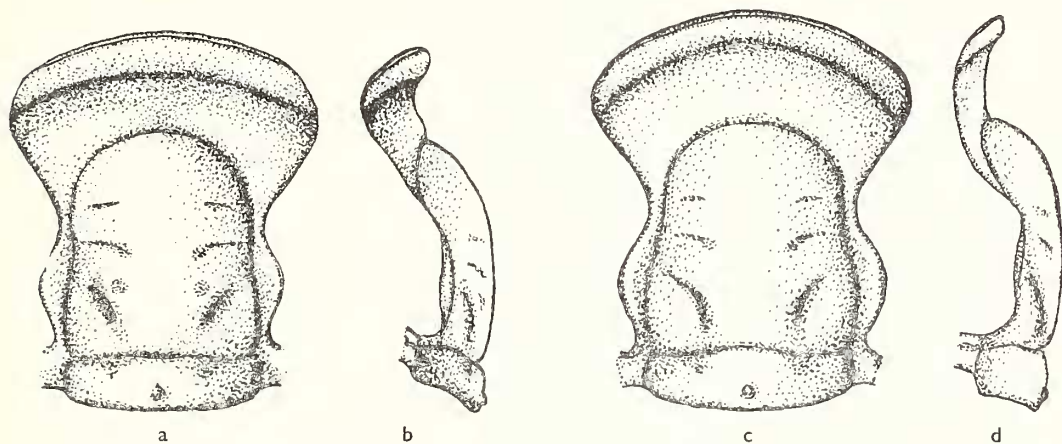
Type locality. Koledník near Beroun.

Horizon. Lower part of the Přídolí Formation, Upper Silurian.

Diagnosis. Subspecies of *P. striatus* differing from the nominate subspecies in a shorter concave preglabellar field, the anterior part of fixed cheeks with convexity of their own, interrupted in the median part only anterior to the frontal lobe of the glabella (in *P. striatus striatus* the preglabellar field is flat and fuses completely with the anterior part of fixed cheeks), wider and deeper border furrow and the sculpture on glabella where,

in addition to small ridges, granules are also present (in the nominate subspecies ridges only).

Remarks. Although Hawle's and Corda's (1847) description is not adequate, the lectotype of *P. troilus* H. et C. differs from *P. striatus striatus* H. et C. from the Kopanina Formation and, on the contrary, agrees with the abundant representative of *Prionopeltis* frequently found in the Přídolí Formation. The lithological character of the rock in which the lectotype has been preserved, furnishes evidence that the assignment to the Přídolian is correct. A close relationship to *P. striatus striatus* (Barr.) is of course indubitable, the differences being of subspecific rank only; *P. striatus troilus* is incontestably a direct descendant of the nominate subspecies.



TEXT-FIG. 3. Comparison of crania: *a-b*, *Prionopeltis striatus troilus* H. et C. (*a*, dorsal view; *b*, lateral view from the left), *c-d*, *Prionopeltis striatus striatus* H. et C. (*c*, dorsal view; *d*, lateral view from the left), $\times 11$.

On the recently found material some changes during the post-larval ontogenic development can be traced: the young specimens (e.g. ICh 3264, 3260) have a somewhat longer glabella, deeper glabellar furrows and a shorter preglabellar field (Pl. 22, figs. 1, 6).

Of other subspecies, *P. striatus praecedens* (Bouček 1934) is distinguished by a long (sag.) preglabellar field, more convex pygidial lobes with shorter marginal spines. *P. striatus incisus* Kegel 1928 from the Upper Silurian of the Harz Mts. also shows a longer preglabellar field and pygidium with a narrower axis, broader lobes with ribs less curved backwards, and by longer and narrower marginal spines.

Occurrence. Přídolí Formation; especially abundant in the lower part (*Monograptus ultimus* Zone), particularly in purely carbonate (organodetrital) facies. Localities: Kosov and Jarov near Beroun (in the earlier collections these localities were both covered by the term Dlouhá hora or Koledník), Zadní Kopanina (the south-western wall of the quarry Horní Dezortův lom, occurrence together with *Scharyia nympha* sp. nov.), Srbsko-Na Bříči, Loděnice-Bubovice (ancient small quarries at the road), Reporyje, etc.

Subfamily TROPIDOCORYPHINAE Přibyl 1946
Genus WOLAYELLA Erben 1966

Type species. *Wolayella wolayae* Erben 1966.

Wolayella ranuncula sp. nov.

Plate 19, figs. 12, 13; Plate 22, fig. 9; text-fig. 4

Derivation of name. From the Latin *ranuncula*, small frog.

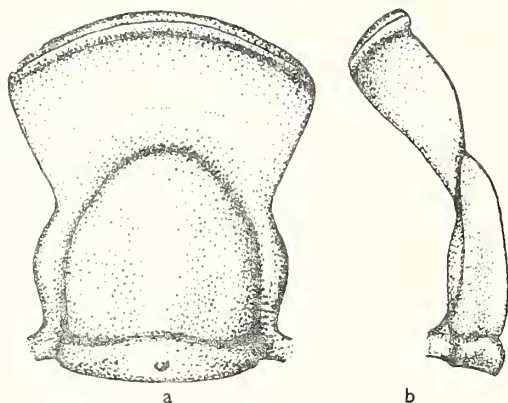
Holotype. Cranium (ICh 3270) figured on Plate 22, fig. 9.

Type locality. Kosoř, quarry in Černá rokle.

Horizon. Upper part of the Lochkov Formation, early Lower Devonian (Upper Lochkovian).

Material. Seven crania preserved in limestone.

Description. Cranium distinguished by a strong convexity, short glabella and long preglabellar field. Glabella roundedly subtrapezoidal in outline, anteriorly broadly rounded, gently arched. Its length (sag.) equals the maximum breadth at the occipital furrow. Dorsal furrows run around glabella in abaxially convex arches, showing a weak adax. bend in the anterior third only. Weakly impressed glabellar furrows: S_1 indicates the separation of the basal lobe which has a slight convexity of its own, very weak S_2 appears in the anterior third of the glabella. Owing to the gentler arching of lateral lobes L_1 and L_2 , the fronto-median part of glabella is more prominent, and consequently, the glabella becomes roof-like with a weak longitudinal keel in the axis. Occipital furrow sharp, less impressed in the proximity of dorsal furrows. Occipital ring moderately arched with a



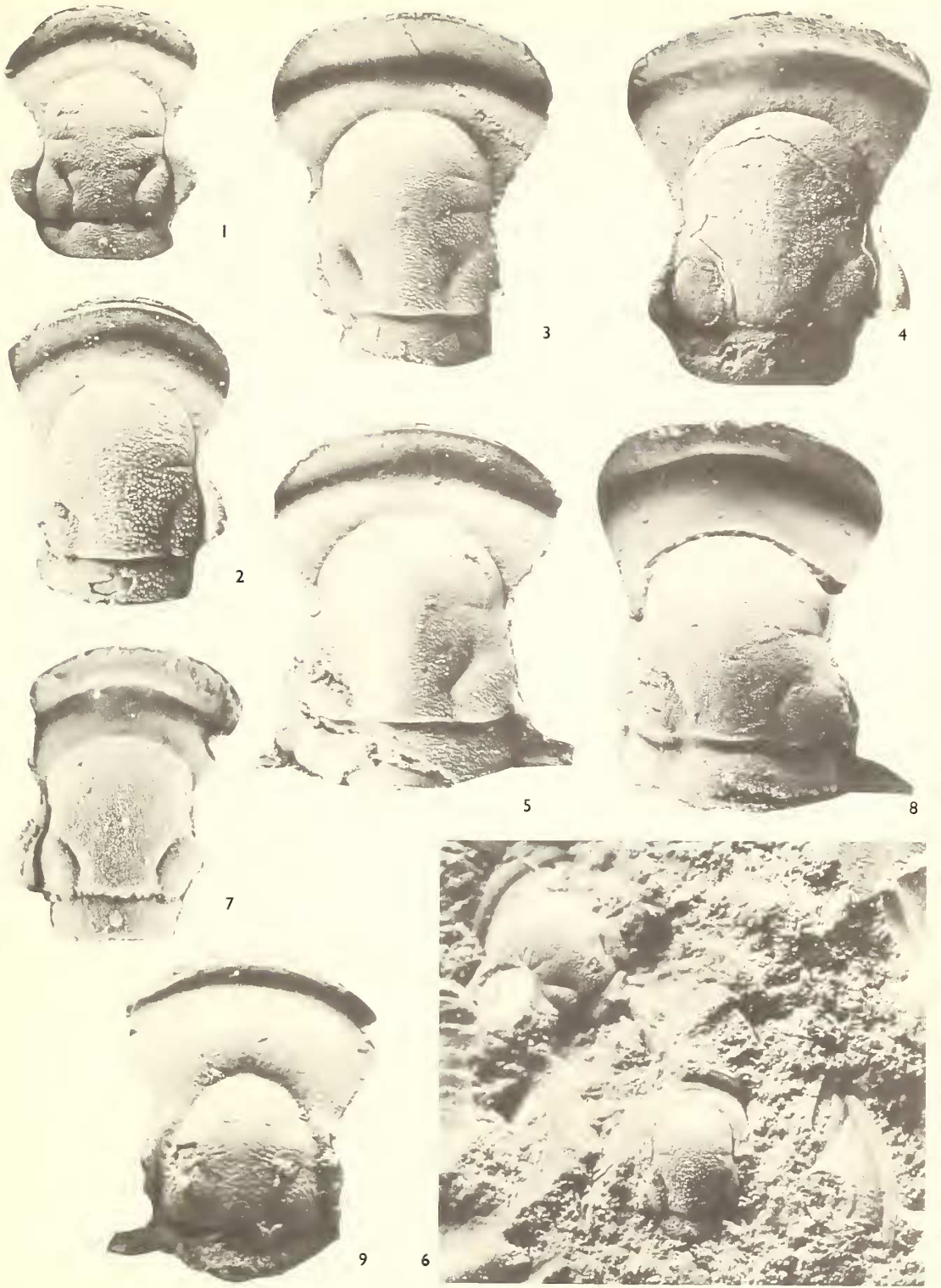
TEXT-FIG. 4. *Wolayella ranuncula* sp. nov., cranium: a, dorsal view; b, lateral view from the left, $\times 11$.

small median tubercle and indistinctly separated occipital lobes. Preglabellar field long

EXPLANATION OF PLATE 22

Figs. 1–6. *Prionopeltis striatus troilus* Hawle et Corda 1847; Přídolí Formation, Kosov (figs. 1–3, 5–6), Zadní Kopanina (fig. 4). 1, Cranium of a younger specimen (ICh 3260); Kosov, $\times 10$. 2, Cranium of a specimen of normal size (ICh 3263); Kosov, $\times 10$. 3, Cranium of a larger specimen (ICh 3262); Kosov, $\times 10.5$. 4, Cranium of a large specimen (ICh 3265); Zadní Kopanina, $\times 10.5$. 5, Cranium (ICh 3261); Kosov, $\times 10.5$. 6, Two crania and left free cheek of young specimens (ICh 3264); Kosov, $\times 12$.

Figs. 7–8. *Prionopeltis striatus striatus* Hawle et Corda 1847; Kopanina Formation, Jarov. 7, Cranium of a smaller specimen (ICh 3318), $\times 11$. 8, Cranium of a larger specimen (ICh 3317), $\times 11$. Fig. 9. *Wolayella ranuncula* sp. nov.; Upper Lochkovian, Kosoř. Cranium, holotype (ICh 3270), $\times 11$.



CHLUPAČ, Silurian/Devonian trilobites